भारतीय मानक
Indian Standard

IS 1448 [P : 157] : 2018

पेट्रोलियम और उसके उत्पादों के लिए परीक्षण के तरीके

[पी : 157]

नमी वाले कैबिनेट में धातु संरक्षण द्वारा जंग से सुरक्षा

Methods of Test for Petroleum and its Products

[P : 157]

Rust Protections by Metal Preservatives in the Humidity Cabinet

ICS 75.100, 77.060

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May 2018 **Price Group 4**

Methods of Sampling and Test for Petroleum, Petroleum Products, Gaseous Fuels and Lubricants Sectional Committee, PCD 01

FOREWORD

This Indian Standard [P : 157] was adopted by the Bureau of Indian Standards, after the draft finalized by the Methods of Sampling and Test for Petroleum, Petroleum Products, Gaseous Fuels and Lubricants Sectional Committee had been approved by the Petroleum, Coal and Related Products Division Council.

In the formulation of this standard, considerable assistance has been derived from ASTM D 1748-02 ‘Standard test method for rust protection by metal preservatives in the humidity cabinet’.

For tropical countries like India, the standard temperature and the relative humidity shall be taken as 27 ± 2°C and 65 ± 5 percent respectively.

In reporting the results of a test or analysis made in accordance with this standard, is to be rounded off, it shall be done in accordance with IS 2 : 1960 ‘Rules for rounding off numerical values (*revised*)’.

Indian Standard

METHODS OF TEST FOR PETROLEUM AND ITS PRODUCTS

[P : 157]

RUST PROTECTION BY METAL PRESERVATIVES IN THE HUMIDITY CABINET

1 SCOPE

This Indian standard prescribes the procedure for evaluation of the rust preventive properties of metal preservatives under high humidity conditions.

2 REFERENCES

The Standards listed below contain provisions which, through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below.

Indian Standard	*Title*
IS 1070 : 1992	Reagent grade water (*third revision*)
IS 3025	Methods of sampling and test (physical and chemical) for water and waste water
[Part 24] : 1986	Sulphates (*first revision*)
[Part 32] : 1988	Chloride (*first revision*)

3 OUTLINE OF THE METHOD

3.1 Steel panels are prepared to a prescribed surface finish and dipped in the test oil. These are allowed to drain and then suspended in the humidity cabinet at 48.9°C for a specified duration of time.

3.2 The size and the number of the rust dots on the surface of the panels determine whether the oil passes or fails the test.

4 APPARATUS

4.1 Location

The humidity cabinet shall be kept in a room maintained at a temperature of 24.1 ± 5.5ºC. The room shall be free from exposure to any acid fumes or gases which can promote corrosion, for example, sulfur dioxide, hydrogen sulfide, ammonia etc.

4.2 Humidity Cabinet

The humidity cabinet has a metal lined wooden cabinet with open top (*see* Fig. 1). It is equipped with a hinged lid consisting of two thickness of de-sized airplane cloth. The cabinet can hold approximately 94 l of distilled water (*see* IS 1070). The water is heated by electric immersion heaters to maintain a temperature of 48.9 ± 1.1°C above the water. The temperature is controlled by two thermostats each located in the air space and below the water level. Air is introduced under the water by means of circular manifold and air diffuser stones. A rotating stage, from which the panels are suspended, rotates at 0.33 ± 0.03 rpm. A drip pan is provided to prevent water from being contaminated.

4.3 Cabinet Cover

The main function of the cover is to provide a tight seal around the top of the cabinet. It is made up of a metal frame. Two thickness of de-sized ultra-pure cotton cloth is tightly tied. The cloth has a regular finish with no other materials added which would otherwise decrease its wetting-out properties. The double thickness of the cloth allows the free exit of the air from the cabinet and simultaneously preventing the dripping of condensed moisture on the test panels. The cloth shall be changed every six months or sooner if it becomes solid or ripped.

4.4 Water Level Control

The water level is maintained at 203 mm level, at the top of the shoulder of the central shaft (*see* Fig. 2). A level control shall be provided so as to operate from carboys of distilled water.

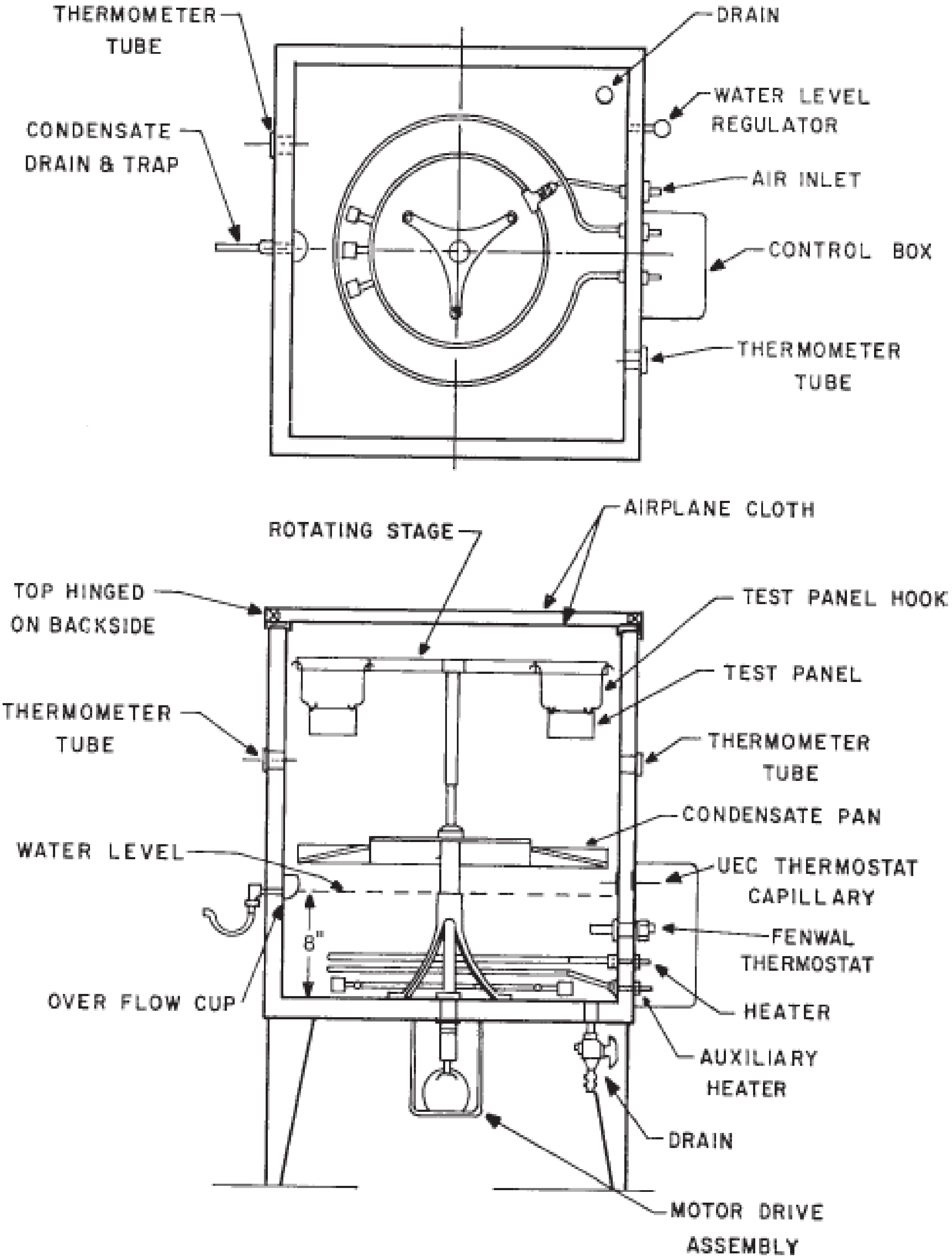


Fig. 1 Humidity Cabinet

4.5 Heaters and Control

The cabinet is provided with two 500 W immersion heaters (*see* Fig. 3). One of them is known as 'fixed' or 'auxiliary' heater used only to bring the cabinet up to operating conditions. The other heater known as the 'intermittent' or 'control' heater is connected through a thermostat located in the air space to prevent overheating of the cabinet if the controlling thermostat fails, or the auxiliary heater is left 'ON' after the warm-up. Failure or overshoot is indicated by a pilot light which turns red.

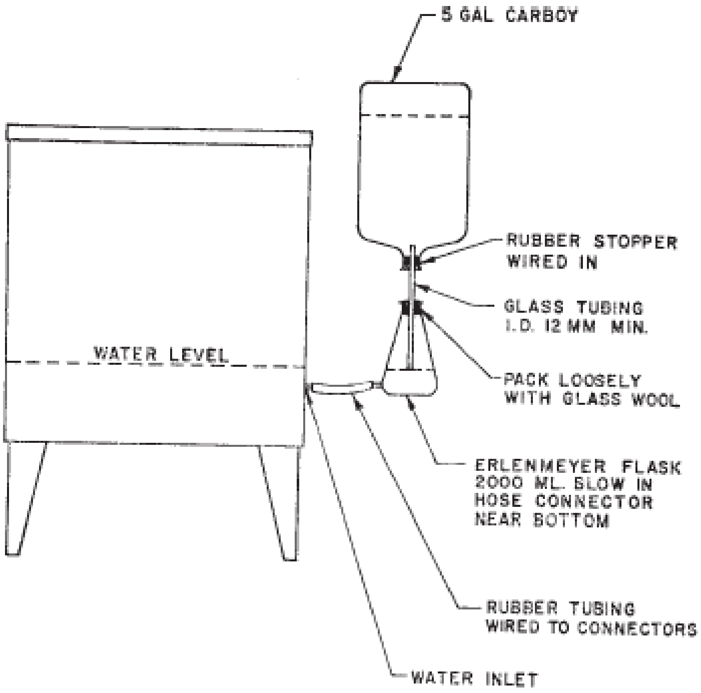

5 GAL CARBOY
RUBBER STOPPER WIRED IN
GLASS TUBING I.D. 12 MM MIN.
WATER LEVEL
PACK LOOSELY WITH GLASS WOOL
ERLENMEYER FLASK 2000 ML. BLOW IN HOSE CONNECTOR NEAR BOTTOM
RUBBER TUBING WIRED TO CONNECTORS
WATER INLET

FIG. 2 WATER LEVELCONTROL SYSTEM

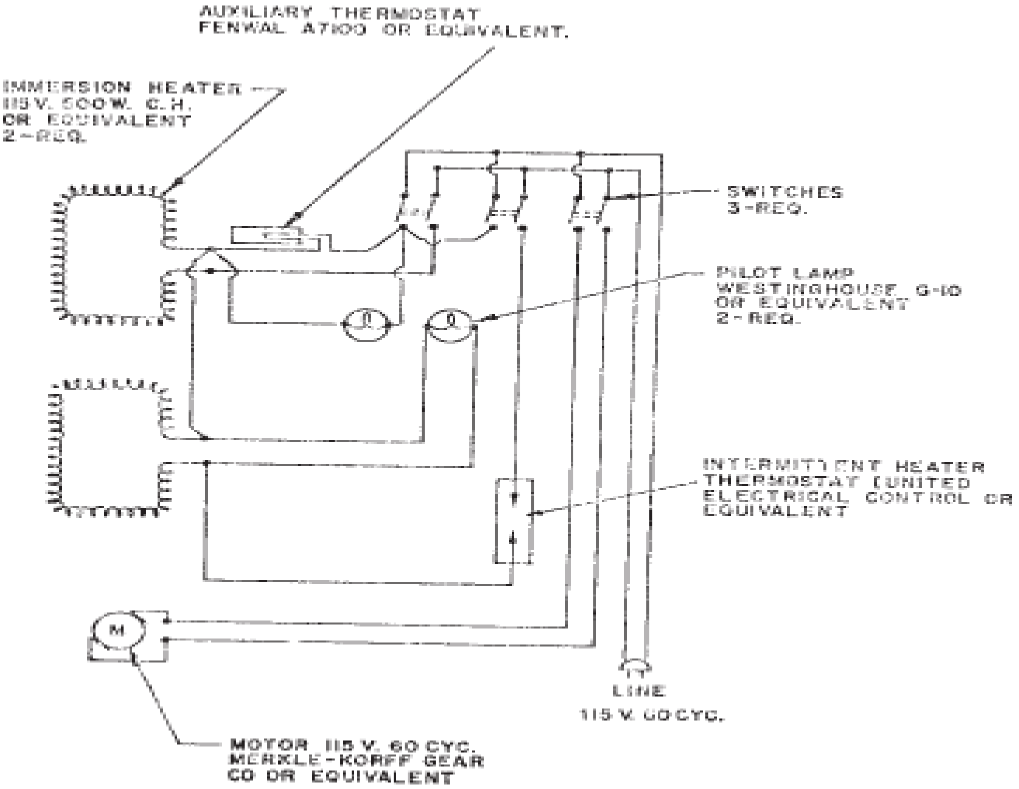

AUXILIARY THERMOSTAT FENWAL A7100 OR EQUIVALENT.
IMMERSION HEATER 115V. 500W. C.H. OR EQUIVALENT 2-REQ.
SWITCHES 3-REQ.
PILOT LAMP WESTINGHOUSE G-10 OR EQUIVALENT 2-REQ.
INTERMITTENT HEATER THERMOSTAT (UNITED ELECTRICAL CONTROL OR EQUIVALENT
M
LINE 115 V. 60 CYC.
MOTOR 115 V. 60 CYC. MERKLE-KORFF GEAR CO OR EQUIVALENT

FIG. 3 HUMIDITY CABINET WIRING DIAGRAM

4.6 Air Supply and Metering System

A constant flow of air must be delivered. The air shall be free of oil and industrial fumes, particularly gases that promote corrosion such as compounds containing sulphur, chloride or nitrogen. A minimum air pressure of 345 kPa should be maintained.

4.6.1 The air metering system has the following parts (*see* Fig. 4):

a) trap and filter,
b) pressure regulator,
c) pressure gage,
d) rotameter,
e) needle valve, and
f) glass wool tower.

4.6.2 Air should be supplied at a rate of 0.878 ± 0.02832 m^3/h at 25°C and 760 mm.

4.7 Air Manifold and Diffusers

Air is introduced into the cabinet by means of ring manifold near the bottom of the cabinet with 20 air diffuser stones spaced equally around the ring. Diffuser stones are connected to the ring by using vinyl tubing.

4.8 Rotating Stage

The steel test panels are suspended on a rotating stage (*see* Fig. 5). The stage shall rotate at 0.33 ± 0.03 rpm.

4.9 Circular Drip Plan

It is mounted under the rotating stage to catch any oil and condensed water dripping from the panels. Liquid from the drip plan is drained outside the cabinet.

4.10 Steel Panels

The following requirements shall be met

4.10.1 *Dimension* — 51.0 mm × 102.0 mm × 3.2 mm, maximum, with two holes of from 3.2 to 2.3 mm in diameter in the corners along one 102.0 mm, maximum, edge. They shall weigh 110 ± 15 g.

4.10.2 Panels shall be made from open-hearth, low carbon, cold-rolled sheet or strip steel.

4.10.3 The edges of the panel shall be rounded and the faces shall be free of pits, scratches or other imperfections. They shall be prepared by surface grinding. If the panel is contaminated with fingerprints, then the fingerprints shall be removed by the use of fingerprint removing compound.

4.10.4 After the finishing of the panels, they are coated with nonvolatile, water-insoluble type rust-preventive material.

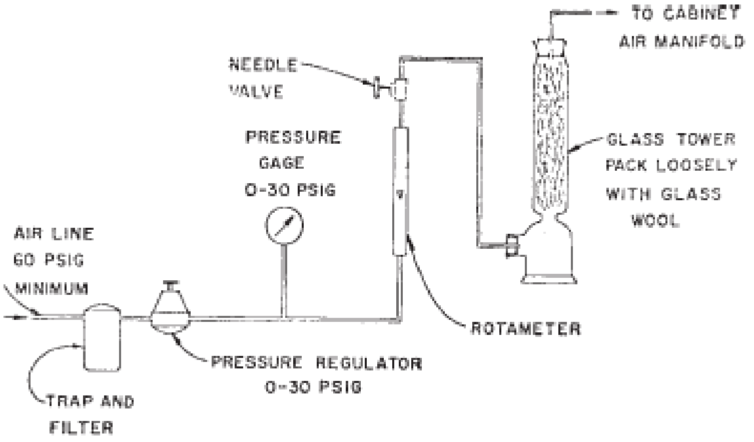
NOTE — Panels from the previous test can be reused if they only contain rust stains that can be easily removed by rubbing with 240 grit aluminum cloth. Panels with rust pits cannot be reused.

4.11 Dummy Panels

These fill the spaces on the rotating stage that are not occupied by test panels. They are also placed under the three arm supports of the rotating stages. These panels are made from stainless steel and have the same dimension as of the test panels.

4.12 Suspension Hooks

These hooks are made from 1.19 mm diameter stainless steel as shown (*see* Fig. 6). Test panels are suspended by using these hooks. They are designed in such a way that water condensed on the hooks and rotating stage will not run down to the panels but will drip of the lower bend of the hooks. The panels are insulated from the cabinet by placing about 25 mm of insulating tube over the end of the wire that hangs on the rotating stage.



LINES AND CONNECTIONS:
(A) FROM AIR LINE TO NEEDLE VALVE-COPPER OR BRASS
(B) FROM NEEDLE VALVE TO CABINET-GLASS AND RUBBER

FIG. 4 AIR METERING SYSTEM

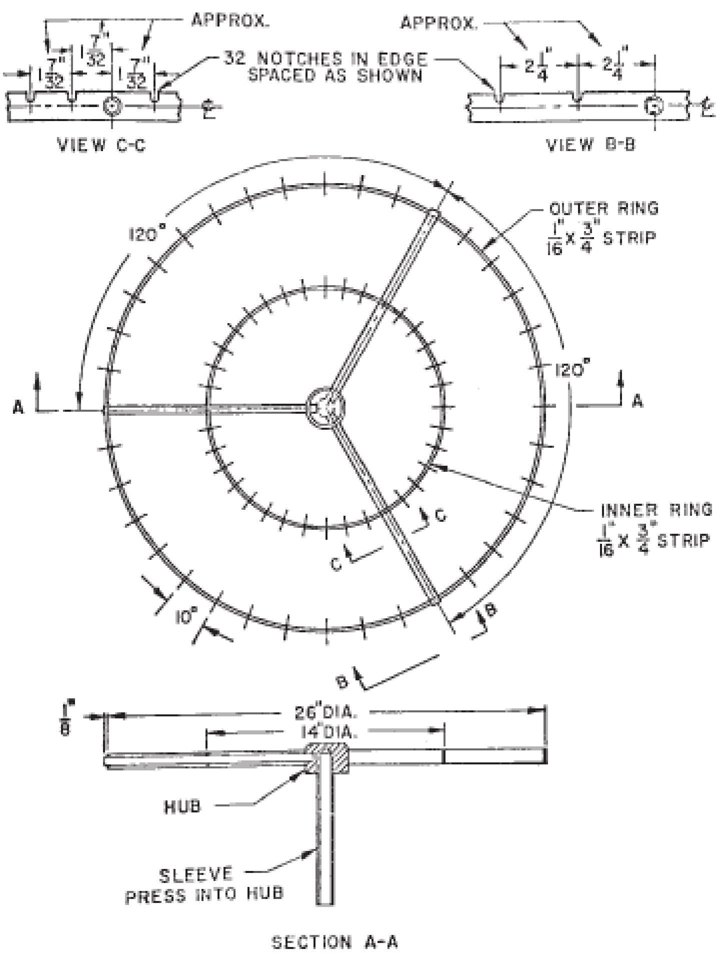


FIG. 5 ROTATING STAGE

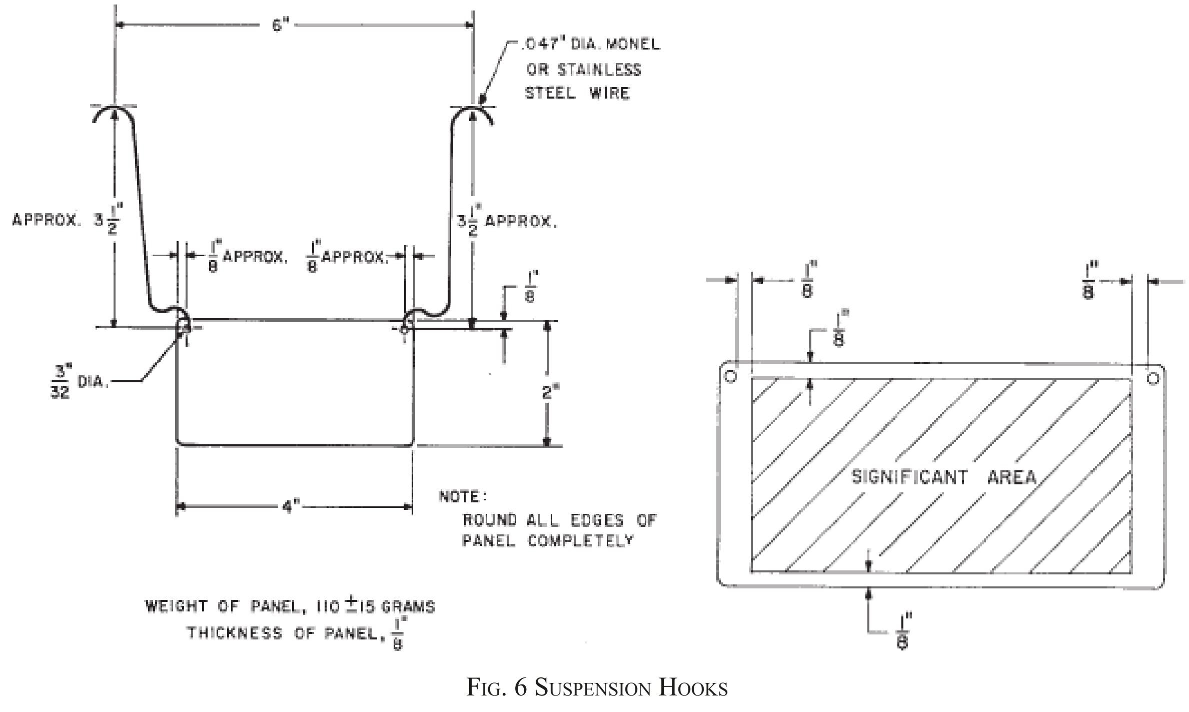


FIG. 6 SUSPENSION HOOKS

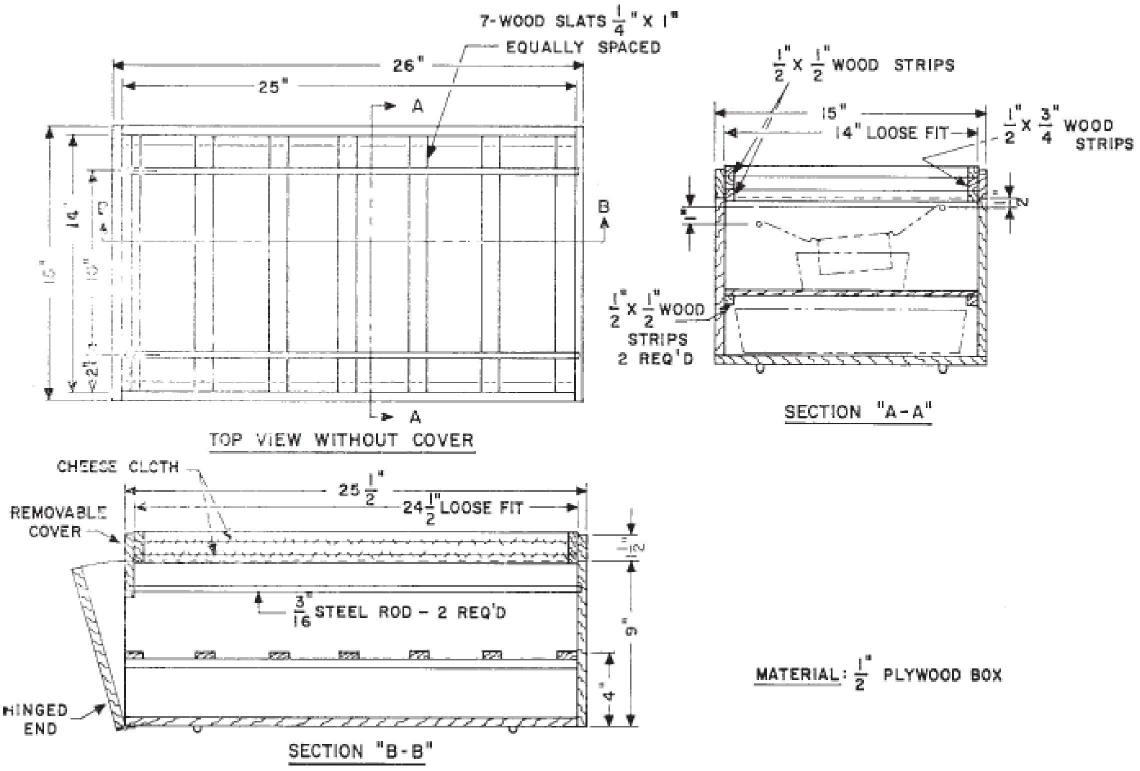


FIG. 7 CHAMBER FOR PANEL DRAINING

4.13 Chamber for Panel Draining

After the panels are dipped in the test material, the panels are drained in a box whose details are shown in Fig. 7. The top of the box is made up of a frame with two thicknesses of cheesecloth which allows the evaporation of the solvents from the test material. If the humidity is above 50 percent, a tray containing saturated solution of magnesium nitrate is placed at the bottom of the box 7.

5 PANEL CLEANING MATERIALS

5.1 Aluminum Oxide Cloth (240 grit)

5.2 Silica Sand

It shall be white, dry, sharp, chloride free. The size of the grains of the sand shall meet the following sieve requirements:

a) hundred percent shall pass through, 2 mm sieve;
b) minimum 90 percent shall pass through, 850 micron sieve; and
c) maximum of 10 percent should pass through, 300 micron sieve.

5.3 Cleaners

A cleaning medium and method is selected in such a way that it is safe, does not form any film or in any way attacks the surface chemically. No class 1 ozone depleting substances shall be used. Hexane is a suitable solvent for this purpose.

6 HUMIDITY CABINET OPERATING CONDITIONS

The following standard conditions shall be maintained during the evaluation of the sample:

a) Air temperature:
    1) Inside the cabinet : 48.9 ± 1.1°C
    2) Outside the cabinet : 24.1 ± 5.5°C
    3) Rate of air : 0.878 ± 0.02832 m^3/h at 25°C and 760 mm Hg
b) Water in cabinet:
    1) Level : 203.0 ± 6.4 mm
    2) pH : 5.5 to 7.5
    3) Oil content : no oil shall be present
    4) Chlorides : less than 20 ppm [confirm to IS 3025 (Part 32)]
    5) Sulfates and sulfites[1] : less than 20 ppm [confirm to IS 3025 (Part 24)]
    6) Speed of rotation : 0.33 ± 0.03 rpm

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[1] Boil the water sample with 10 ml saturated bromine water before making the test for sulphates.

7 PANEL PREPARATION

7.1 Take a new panel and wash away the rust preventive material coated on it carefully using the selected solvents (*see* **5.3**). Only those panels shall be used which comply with the design requirements.

7.2 The following shall be kept in mind while polishing the panel.

7.2.1 The panels shall not be touched with bare fingers. There shall be no fingerprint marks on the panels.

7.2.2 Always keep the panel on a clean and dry surface.

7.3 Surface Finishing by Polishing

7.3.1 Polishing is required only to give the panels a fresh, clean and active surface. Such materials shall not be used which can change the surface characteristics of the panels. Aluminum oxide abrasive cloth can be used for polishing operations. Polish all the four round edges, ream out the two holes and wipe clean.

7.3.2 While polishing, the panels shall be kept on clean paper to avoid contamination. The panel may also be held by hand using paper between the fingers and the steel surface.

7.3.3 Do not scratch the surface by using short or curved strokes. Examine the entire surface, and if scratches or imperfections are there then continue polishing till a fresh and clean surface is obtained.

7.3.4 Remove the dust from the surface using a gauze followed by a surgical gauze dipped in the suitable solvent. Finally submerge the panel completely in the selected solvent to preserve it.

7.3.5 Before using the panel, rinse it in the hot solvent (*see* **5.3**) and store in a desiccator until cool.

7.4 Surface Finishing by Sand or Aluminum Oxide Blasting

7.4.1 Blast the edges and slightly blast the back of the panel with the blasting material.

7.4.2 Blast the unnumbered side, or the test surface to a fresh, uniformly abraded surface. Just after the blasting, place the panel in a beaker containing non-reactive solvent.

7.4.3 Before using the panel, rinse it in the solvent selected and store in a desiccator until it cools.

7.4.4 Panels have to be used on the same day of the preparation.

8 PROCEDURES

8.1 Bring the sample oil to a temperature of 24.1 ± 5.5°C and pour in a clean, dry and tall glass beaker. Remove the panel from methanol by using a clean suspension hook. Hang the panel in the vapor space above the boiling solvent for 5 min to ensure that the panel is completely wet with the solvent.

8.2 Dip the panel in the boiling solvent (*see* **5.3**) for 10 s. After removing it make sure that there are no stains on the panel and keep the panel in the air for some time.

8.3 Now dip the panel in the sample oil and slowly stir it for 10 s. Now withdraw the panel from the sample oil with a continuous motion and drain it for 10 s.

8.4 Again dip the panel in the sample oil with slow stirring for 1 min. Now remove the panel from the test oil and do not shake it.

8.5 Use the second clean suspension hook, and insert it in the second hole of the panel. Suspend the panel by the two hooks and drain it approximately for 2 h. More than one panel may be dipped in the same test oil for testing.

8.6 After the panel has been drained, suspend the panel in the humidity cabinet with the numbered side of the panel trailing as the stage rotates. Keep the test panels in the humidity cabinet for the specified number of hours.

9 EXAMINATIONS

9.1 Each panel represents two test surfaces. Each side of the test panel is considered as a separate test surface.

9.2 Remove the test panels from the cabinet after the time specified. Wash the panels with the solvent selected. Observe the test panels within 10 min under a fluorescent light to determine the results as follows:

9.2.1 *Pass* —The test surface shall pass if, it contains not more than three rust dots, and none of them is larger than 1 mm in diameter.

9.2.2 *Fail* — The test surface shall fail if it contains more than 3 rust dots of any size or if any of the dots is larger than 1 mm in diameter.

10 REPORTING

Report the test result as Pass or Fail including the following details:

a) Type of panel preparation:
   1) polished,
   2) sand blasted, or
   3) aluminum blasted.
b) Number of test surfaces or panels;
c) Number of passing test surfaces or panels; and
d) Hours in the humidity cabinet.

11 PRECISION

Result of the duplicate test shall not differ by more than the amounts given below:

	Sandblasted Percent	Al_2O_3 *Blasted Percent*	*Polished Percent*
Repeatability	27.8	46.1	97.3
Reproducibility	141	1.2	264

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Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

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